EXTRACTION OF FEMALE CRUDE SEX PHEROMONE OF ONION ARMYWORM *Spodoptera exigua* HÜBNER (LEPIDOPTERA: NOCTUIDAE) AND ITS ATTRACTANCY EFFECT

RYAN ALEXIS P. BAUTISTA

An Undergraduate Thesis Submitted to the faculty of the Department Crop Protection College of Agriculture, Central Luzon State University Science City of Munoz, Nueva Ecija, Philippines in Partial Fulfilment of the requirement for the Degree of

BACHELOR OF SCIENCE IN AGRICULTURE
(Crop Protection)

SEPTEMBER 2019

ACCEPTANCE SHEET

This undergraduate manuscript entitled **"EXTRACTION OF FEMALE CRUDE SEX PHEROMONE OF ONION ARMYWORM *Spodoptera exigua* HÜBNER (LEPIDOPTERA: NOCTUIDAE) AND ITS ATTRACTANCY EFFECT,"** prepared and submitted by **RYAN ALEXIS P. BAUTISTA**, in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURE (CROP PROTECTION)**, is hereby accepted:

MARILYN G. PATRICIO, Ph.D.
Adviser

Date Signed

ELAIDA R. FIE. GALAN, Ph.D.
Critic

Sept 2019
Date Signed

CELYNNE O. PADILLA, M.Sc.
Department Research Coordinator

Date Signed

Accepted as partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURE (CROP PROTECTION):**

RONALDO T. ALBERTO, Ph.D.
Department Chairperson

Date Signed

MARIA LUISA T. MASON, Ph.D.
College Research Coordinator

Date Signed

ERNESTO A. MARTIN, Ph.D.
Dean, College of Agriculture

Date Signed

BIOGRAPHICAL SKETCH

The author is the first child of four children of Reysie Bautista-Okamoto. He was born on January 27, 1996 at Mandaluyong General Hospital. He finished his kindergarten at Our Lady of the Sacred Heart Academy (OLSHA) at Guimba, Nueva Ecija in the year 2002. He studied at the same school for elementary education and finished in year 2008. He finished his high school education at Our Lady of the Scared Heart College (OLSHCO) at year 2012. He took up Bachelor of Science in Animal Husbandry in Central Luzon State University (CLSU) Science City of Munoz Nueva Ecija but he shifts to another course Bachelor of Science in Agriculture Major in Crop Protection with field of specialization in Entomology.

ACKNOWLEDGEMENT

This study would not have been accomplished without the help of every individual behind as they serve as an inspiration and help to the author. Therefore, the author would like to express his deepest and sincere thanks and appreciation to those who shared their time and efforts towards the success of this study

Above all and anyone else, to the one who guided his paths and gave light in every direction that he took and for all the courage that he gave when the author is down to rise up again. For all the helping hands, the Almighty Father gave when the author almost gave up. To all the people that helped, the author; this would not be possible without His grace and love.

This study would not be possible without the support, knowledge, patient and understanding of Dr. Marilyn G. Patricio. The author is sincerely thankful for being his thesis adviser.

To Mr. Jose Emmanuel de Luna, who stood as thesis adviser in the retirement of Dr. Patricio; the author is thankful for the advice and time allotted to finish the study.

To Dr. Bonifacio F. Cayayab for his kindness, guidance and advices for the success of the study.

To the project team of Dr. Navasero of National Crop Protection Council for giving some reading material for the enhancement of the study.

To Dr. Sally Rafael for giving the author some knowledge about the study and solvents used in extraction.

To his critic, Dr. Elaida R. Fiegalan for her kindness, guidance and criticism for the enhancement of the paper.

To the then Department chairperson Dr. Marita S. Labe for giving the motivation for facing bigger challenges in life; and the incumbent chairperson, Dr. Ronaldo T. Alberto for assistance in ensuring the final defense will proceed and for guiding the author in finishing the manuscript

To the Department of Crop Protection Faculty and Former Faculty for giving inspirational messages, creative suggestions, help and support that the author considers creative criticism for a better version. To the staff, Ms. Sheryl Marcha for giving supportive message and providing the materials during the conduct or study.

To his Out-Reach Philippines Family, to his former boss Tori O. Robertson and Felina S. Delfin. To all OPI staff Tita Ami, Tita Ems, Ate Krizza, Ate Rose, Kuya Elvis and Kuya Rhed for giving the author chance to be a part your family.

To his Gamma Sigma Scorpion Family especially to his batch mates, brothers, and sisters for giving unconditional laughter and joy. The author is grateful to find companions and second family in his journey in CLSU.

To his Pest Management Society Family for helping and believing on each other.

To his Entomates for their endless support and endless laughters that led to everlasting friendship.

To kuya Miguelito Isip for letting the author join the surveillance of armyworm.

To Philscat Family specially to Ate Mamay, Sir Val, Ate Leila and Mary Grace for supporting and giving criticism to be better

Most of all the author is sincerely thankful to the owners of the onion farmers that let him used their field for collection and trapping armyworm, Manong Fred Policarpio, Nanay Filipina Salavation, Mr. Manny dela Cruz, Mr. Danilo Cucal, and Ate Melody Torres.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

BAUTISTA, RYAN ALEXIS P., Department of Crop Protection, College of Agriculture, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines. September 2019. **EXTRACTION OF FEMALE CRUDE SEX PHEROMONE OF ONION ARMYWORM *Spodoptera exigua* HÜBNER (LEPIDOPTERA: NOCTUIDAE) AND ITS ATTRACTANCY EFFECT**

Adviser: Marilyn G. Patricio, Ph.D.

The study was conducted to evaluate different solvents in extracting crude sex pheromones in female onion armyworm to determine the attractancy effect of the crude sex pheromone to male armyworm moths under laboratory condition and to test the efficacy of the extracted crude pheromones hormones under field condition. The protocol for extraction was based on Cayabyab (1997). The eighth and ninth segments of the abdomen of the female armyworm consisting the pheromone gland were excised, then soaked in solvent (Acetone, Hexane and Ethanol), then placed with rubber septum and the crude pheromone was extracted. The attractancy test was done using no choice method and 20 active male moths (one to two day old) were used per replication. The percent attracted male moth was recorded at 5 min, 10 min, 15 min, 20 min, 25 min and 30 min after released. Treatment 3 (Hexane 1:1) was found significantly attractive on the male moth under laboratory condition after 30 min of observation time with 30% attractancy and Treatment 6 (Ethanol 1:2) was the least with 11.67% attractancy. Number of male moth caught per trap was monitored daily for one week. Also, number of armyworm larval and damage rating were recorded from 30 sample onion plants

Keywords: sex pheromone, attractancy effect, extraction, onion armyworm

LITERATURE CITED

AGUDA R. (1977). Effect of Attacus Juvinile Hormone on the Common Cutworm *Spodoptera litura* F. (Doctoral dissertation) University of the Philippines, Los Baños. 8-11.

ARIDA G.S., B.S. PUNZAL, C.C RAVINA JR, V.P. GAPUD, E. RAJOTTE & E. TALER. (2002). Sex Pheromone in Pest Management Monitoring Adult Density of *Spodoptera litura* and *Spodoptera exigua* in Rice Onion Cropping System. 28(8), 23-29.

AZIDAH A. A., & M. S. AZIRUN. (2006). Life History of *Spodoptera exigua* (Lepidoptera: Noctuidae) on various host plant. 19(1): 613-618.

BAKER T.C, L.K. GASTON, M. M. POPE, L. S. KUENEN & R. S. VETTER. (1981). A High-Efficiency Collection Device for Quantifying Sex Pheromone Volatilized From Female Glands and Synthetic Sources.161-168.

BAKER T.C., W. FRANCKE, J.G.MILLAR, C. LOFTSEDT, B. HANSSON, J.W. DU, P.L. PHELAN, R.S. VETTER, R. YOUNGMAN, & J.L TODD. (1991). Identification and Bioassay of Sex Pheromone Component of Crab Moth *Ectomyelois ceratoniae* Z. 19(1): 54-60.

BAKER T.C. (2011). Insect Pheromones: Useful Lessons for Crustacean Pheromone Program. 54 (3), 60- 65.

BUTIN R.G., LEE D.R., WILSON D.M., & MCPHERSON R.M. (2000). Fall Armyworm Damage Assesment Procedure.

CANDANO R.N. (2017). Progress Report on Mass Rearing of *Spodoptera exigua* on the Laboratory.

CAYABYAB B.F. (1997). Monitoring and Computer Simulation System for Corn Borer *Ostrinia furnacalis*. 1-6. (Doctoral dissertation) University of the Philippines, Los Baños. 1-16.

CAYABYAB B.F., M.D. EBUENGA, P.G. GONZALES, M.V. NAVASERO, M.M. NAVASERO, M.G. PATRICIO, R.N. CANDANO, M.S. GUERRERO, K.P. ARDEZ, G.A. S. BURGONIO, W. DE PANIS & B.A.G. CAYABYAB. (2017). Seminar in Insect Pheromone in IPM. Regional Crop Protection, PhilRice, Science City of Muñoz, Nueva Ecija.

CAPINERA J.L. (2014). Beet Armyworm, *Spodoptera exigua* (Hübner) (Insecta:Lepidoptera: Noctuidae). 16(2), 5-18.

EDMUNDS A.J. (2010). Host Marking Pheromone (HMP) in the Mexican Fruitfly *Anastreph aludens*. (7), 60- 65.

GREENBERG S.M.,T.W. SAPPINGTON, B.C. LEGASPI,T.X. LIU, & M.SETAMOU. (2001). Feeding and Life History of *Spodoptera exigua* (Lepidoptera Noctuidae) on Different Host Plants. 28(7), 1-15.

GOMEZ K.A., & A.A GOMEZ. (1984). Statistical Procedures for Agricultural Research. 567- 577

INSECTICIDE RESISTANCE ACTION COMMITTEE (IRAC). (2012). Strategies for Sustainable Control Beet Armyworm *Spodoptera exigua* Hübner. http//www.irac-online.org/beetarmyworm.

JAYARAJ J. (2013). Controlling Fruitfly Menace in Bitter Gourd. http//www.thehindu.com/ci-tech/science/controlling-fruit-fly-menace-in-bitter-gourd/article4474059/.com.

KANADEA E. ,& D. S. BHATKHANDEB. (2016). Extraction of Ginger Oil Using Different Methods and Effect of Solvents, Time and Temperature to Maximize Yield

KRISHNAIAH K., I.C. PASALU, & N.R.G. VARMA. (2001). Potential of Pheromone in Rice Pest Management. 34(1): 12-17 .

LI J.X. (1987). Influence of Peanut Cultivars on the Development and Feeding Activity on Common Cutworm *Spodoptera litura* F. (Doctoral dissertation) University of the Philippines, Los Baños 1-11.

LIBERLES S. D., & L. B. BUCK. (2006). A Second Class of Chemosensory Receptors in the Olfactory Epithelium. 15(1), 645-650.

MUNICIPAL AGRICULTURAL OFFICE (M.A.O). (2017). Data on Onion Armyworm *Spodoptera exigua.*

MILLER J. (2002). Manual on Properties of Organic Solvents. 6(3), 15-23.

MOHAMMED A., A. MASHALY, M. F. ALI, & M.S. AL-KHALIFA. (2012). Trail Pheromones in Pest Control, New Prespective in Plant Protection. 122-139.

NAVASERO M., M.M NAVASERO, B.F. CAYABYAB, R. CANDANO, M. EUBUENGA , A.S.B. GIDEON , N. M BAUTISTA , E.M. AQUINO, & G.G. GASPAR. (2017). Investigation on the 2016 Outbreak of the Onion Armyworm *Spodoptera exigua* Hübner (Lepidoptera:Noctuidae) in Onion Growing Areas in Luzon.

PLANTWISE. (2016). Armyworm Hostplants. http//www.plantwise.org/Beetarmyworm.

PHILIPPINE STATISTIC AUTHORITHY (P.S.A.). (2016). Major Vegetables and Rootcrops Quarterly Bulletin. 10(1), 55

PROVINCIAL AGRICULTURAL OFFICE (P.A.O). (2016). Data on Onion Armyworm Outbreak in Nueva Ecija.

REGINER F., and J. Law. (1968). Insect Pheromone. *Journal of Lipid Research.* 9 (1), 541- 551

REGIONAL CROP PROTECTION CENTER REGION III (RCPC). (2016). Onion Armyworm Outbreak in Nueva Ecija Terminal Report.

SEYBOLD J. & S. DONALDSON. (2015). Pheromones in Insect Pest Management. 57(1), 1-2.

TETSU A. (2013). Pheromone Signaling Methods and Protocols. 67(2), 3-13.

TUMLINSON J.H., & E.R. MITCHELL,P.E. SONNET. (1981). Sex Phermone Components of the Beet Armyworm *Spodoptera exigua.* 67(2), 198-200.

VERHEGGEN F.J., E.HAUBRUGE, & M.C. MESCHER. (2009). Alarm Pheromones Chemical Signaling in Response to Danger. 67(2), 12-23

WISEMEN B.R., and N.W WIDSTROM. (1984). Armyworm Damage Rating in Onion at Various Infestation Levels and Plant Development Stages

WAKAMURA S., & M. TAKAI. (1988). Control of Beet Armyworm in Open Fields with Sex Pheromone.

WAKAMURA S., & M. TAKAI. (1990). Control of Beet Armyworm *Spodoptera exigua* with Synthetic Sex Pheromone.

WALTER S. (2005). Manual on Pheromone Reception. 1(2), 1-26.

ZHENG X. L., X.P. CHONG, X.P. WANG, & C.L. LEI. (2001). A review of Geographic Distribution, Overwintering and Migration in *Spodoptera exigua* Hübner (Lepidoptera; Noctuidae). 15 (1), 23-37.